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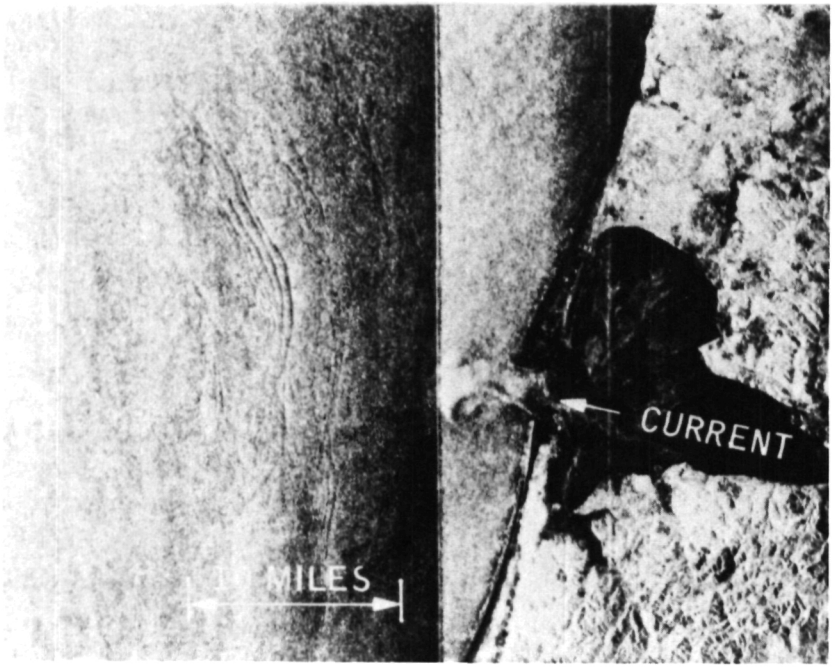
OCEAN CURRENTS MEASURED BY SEASAT RADAR

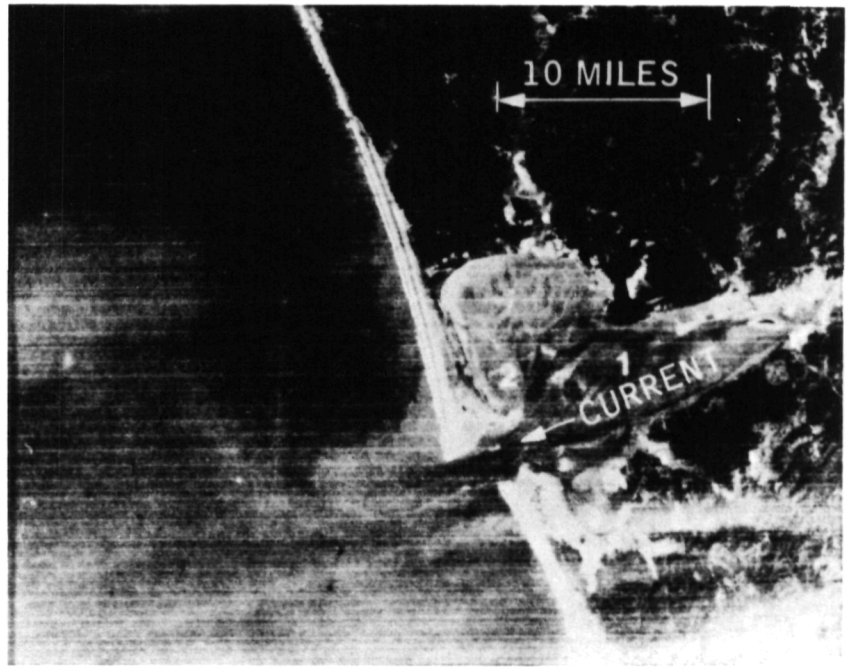
Recent work at JPL has demonstrated that the Seasat Synthetic Aperture Radar (SAR) is capable of detecting and measuring ocean current parameters. Since the ocean surface within the current boundaries is travelling at a different velocity than the rest of the ocean surface, it should be expected that the modulations due to the features within the current region would be shifted in position in the SAR image. This would be apparent as a bright band in the image obtained by the SAR on the side of the current boundary toward which average displacement of the image components takes place. A corresponding dark band should be observable on the opposite side. The width of the dark and the light bands should be related to the velocity profile of the current.

The above concept was tested with a Seasat image of Gray's Harbor, Washington, shown in the figure (opposite left). The satellite image was obtained during an ascending orbit moving toward the north with the subtrack location approximately 290 kilometers from the swath center to the west of the harbor entrance in the satellite range direction. The bright band appears clearly at the south ebb current boundary as predicted. A somewhat diffused but visible dark band can also be discerned at the north current boundary. To demonstrate that these bands are generated by the doppler displacement of moving surfaces in the SAR image, a Landsat-1 image of Gray's Harbor during an equivalent ebb cycle is shown on the right. The optical Landsat image shows no bright or dark bands at either current boundary. By measuring the width of the bright band in the SAR image, an estimate of the current magnitude is shown to be 1.0 ± 0.4 meters per second. This compares favorably with measurements obtained from the tidal current tables at the time of the satellite crossing, which give an ebb current of 1.4 m/s.

It is also possible to obtain measurements of the radial direction of the current velocity directly from the SAR signal, by measuring the doppler shift in the signal transform. Future work will refine measurement of current magnitudes from image shifts and develop current measurement techniques from signal doppler shifts.



SEASAT - SAR IMAGE
7 JULY 1978



LANDSAT-1, BAND 5 IMAGE
8 JANUARY 1973

Grays Harbor, Washington